6 STUDIES AND MONITORING

Since 1951 (before the Savannah River Plant (SRP) began operation), an intensive surveillance program has been maintained to monitor the compositions of effluents from the SRP facility, to measure radioisotope concentrations in the plant environs, to assess the ecological health of the overall SRP environment, and to determine compliance with applicable standards. The results of these environmental monitoring programs are reported annually to the public (e.g., Du Pont, 1983a). Section 6.1 describes the scope of these ongoing programs; Figure 6-1 shows the locations of monitoring stations. In addition, Section 6.1 summarizes two special site-wide study programs that reflect commitments made under a Memorandum of Understanding between the U.S. Department of Energy (DOE) and the State of South Carolina. Environmental monitoring programs specifically related to restart and operation of the L-Reactor are described in Section 6.2.

6.1 SRP MONITORING PROGRAMS

6.1.1 Radiological monitoring programs

The program includes the monitoring of air on and off the site, water from SRP streams and the Savannah River, the SRP ground water, and samples of soil, vegetation, food, drinking water, animals, and fish for their radionuclide content. In addition, aerial radiological surveys of the Savannah River Plant and surrounding areas are conducted periodically by the DOE Remote Sensing Laboratory, operated by EG&G. Independent radiological monitoring programs are also conducted by the South Carolina Department of Health and Environmental Control (SCDHEC) and the Georgia Department of Natural Resources (GDNR). BF-3

Air

Concentrations of radioactive materials in the atmosphere and rainwater are measured at 13 monitoring stations near the SRP perimeter and at 12 stations approximately 40 kilometers from the center of the site. Additional air monitoring stations are located at Savannah and Macon, Georgia, and at Columbia and Greenville, South Carolina. These latter stations serve as reference points for determining background conditions. This system permits comprehensive surveillance of atmospheric radioactivity and makes it possible to differentiate between worldwide fallout and SRP releases.

SCDHEC independently monitors levels of alpha, beta, and gamma radioactivity on a biweekly frequency at six locations in the SRP vicinity. GDNR monitors concentrations of alpha, beta, and gamma radioactivity monthly at three locations. In addition, GDNR monitors quarterly for plutonium-strontium composite concentrations at these three locations. Air sample concentrations by both agencies are consistent with SRP data from comparable monitoring locations. BF-3

SRP measures radiation levels continuously with thermoluminescent dosimeters (TLDs) at 165 locations, in a 20,700-square-kilometer area around Savannah River Plant (Figure 6-2).

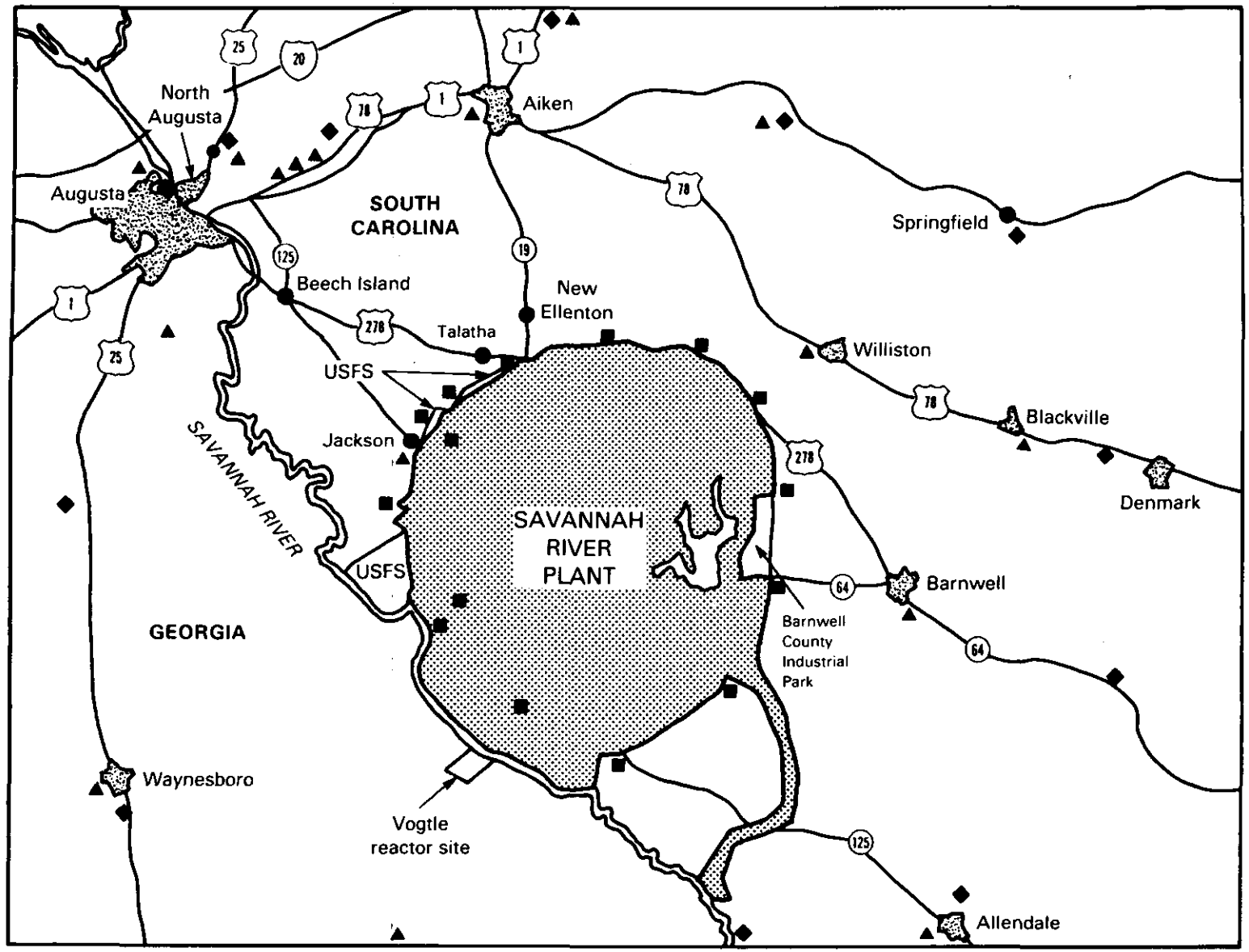

Figure 6-1. Continuous air monitoring stations and public water sample locations.

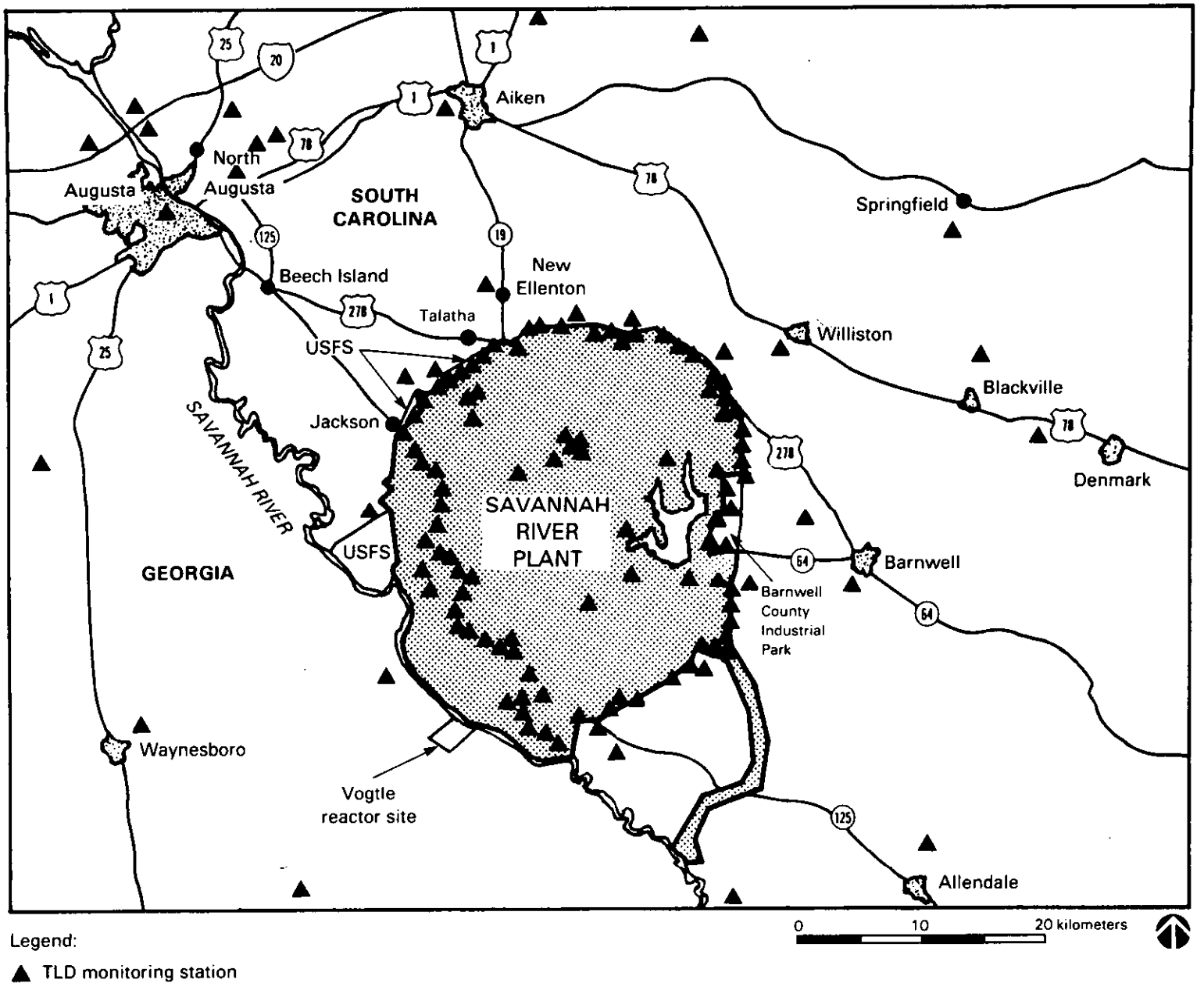

Figure 6-2. TLD monitoring stations.

Additional TLD measurements are made by SCDHEC at 27 locations, principally around the Chem-Nuclear Services, Inc., facility near Barnwell. TLD measurements made quarterly by SCDHEC were consistent with SRP data at select locations from 1974 to 1982.

BF-3 GDNR measures TLD values on a quarterly frequency in Georgia near SRP at 25 locations. TLD measurements made by GDNR during the 1980-1982 period were approximately 60 percent lower than TLD measurements by SRP. These discrepancies can be attributed to the locations of the dosimeters or to the type of dosimeter. GDNR intends to correct these reported TLD measurements (GDNR, 1983).

Savannah River

The site is drained by five streams that flow to the Savannah River. Releases to these onsite streams are monitored for radioactivity. Weekly water samples are collected at five river locations above, adjacent to, and below Savannah River Plant. The samples are analyzed for alpha, nonvolatile beta, and a large number of specific radioisotopes, including tritium and cesium-137.

SCDHEC collects samples at six river locations ranging from North Augusta, South Carolina, to the Beaufort-Jasper water-treatment facility below SRP; these samples are monitored at varying frequencies for concentrations of alpha, nonvolatile beta, gamma, and tritium. Tritium concentrations in the Savannah River at the U.S. Highway 301 bridge and at the Beaufort-Jasper Water Treatment Plant were consistent with SRP data from 1975 to 1982.

BF-3

GDNR monitors river water quarterly for concentrations of alpha, nonvolatile beta, and tritium at seven locations from Augusta, Georgia, to the Highway 301 bridge. GDNR data for tritium in surface water are comparable with SRP results. GDNR has made special surveys along the Savannah River at additional sampling locations. Tritium levels in river water were comparable to levels found at SRP.

Savannah River and onsite stream floodplain sediment

Since 1975, sediment samples have been collected in floodplain areas of the Savannah River at six locations above, adjacent to, and below the Savannah River Plant. Sediment sample collection points were selected at strategic locations to obtain an estimate of the maximum accumulation of radioactivity in the river bed. Following rigorous analyses for various radionuclides, sediment results are useful in the determination of potential changes in radioactivity transport in the river.

GDNR analyzes river sediment samples annually at multiple river locations for gamma activity. These values were determined to be within the range of SRP data. Specific radionuclides are analyzed based on initial gamma results.

BF-3 Since 1977, sediment samples have been collected from onsite SRP stream floodplain areas. Samples are collected along these streams at multiple transects and composited for radioanalysis. These floodplain sediment data from onsite streams provide an annual accounting of sediment radioactivity from SRP sources, global fallout, and other sources.

Swamp

Comprehensive surveys were conducted annually in the Savannah River swamp between Steel Creek Landing and Little Hell Landing from 1974 to 1977. These surveys included soil, vegetation, animals, fish, and TLD-radiation measurements along 10 trails transecting the swamp. These annual surveys did not show any change in radiological conditions, and their frequency was reduced to once every 5 years, although annual TLD measurements were continued. A comprehensive survey was conducted in 1982, and another comprehensive survey will be conducted to determine any changes in radiological conditions during the first year after restart of L-Reactor operation.

Soil

Since 1973, soil samples have been collected at both the SRP boundary at strategic perimeter locations and off the site at two locations. Composited sediment samples are analyzed for individual radionuclide dry-weight concentrations and for cumulative deposition of radioactivity by individual radionuclides. The two offsite locations, which are about 160 kilometers from the center of the plant, serve as control locations.

Additional terrestrial sediments are collected from eight onsite locations encompassing the Separations Areas; these sediments are analyzed for radionuclide concentrations and cumulative deposition, similar to the plant perimeter samples.

BF-3

GDNR collects sediment samples in Georgia near the SRP on a quarterly basis. These samples are analyzed for gamma activity; they have been found to be within the range of SRP data.

Ground water

Ground-water samples from a large number of monitoring wells are collected and analyzed for radioactivity content (Du Pont, 1979). Drinking-water supplies at 23 onsite facilities and 14 surrounding towns are analyzed semiannually for alpha, nonvolatile beta, and tritium. The remaining samples of ground water are collected from wells installed in the vicinity of production and waste-management facilities. Monitoring-well samples from SRP production and waste-management facilities are also analyzed for alpha, nonvolatile beta, and tritium.

SCDHEC monitors for concentrations of alpha, nonvolatile beta, and tritium in ground water from wells in six nearby communities and from additional wells around the Barnwell Nuclear Fuel Plant. GDNR monitors for the same parameters at 10 Georgia locations. Both State programs are on a quarterly frequency.

BF-3

Vegetation and food

Grass samples (generally Bermuda) are collected routinely during the growing season at all air monitoring locations. Samples are analyzed individually for alpha, nonvolatile beta, and tritium, and are composited monthly for specific gamma analyses. Other vegetation samples are collected and analyzed as part of the general survey program as well as when an unusual release of radioactivity is suspected.

SCDHEC collects vegetation samples annually at six locations around the Chem-Nuclear Services, Inc., facility and measures them for gamma activity. BF-3 GDNR collected quarterly vegetation samples at eight locations during the 1980-1982 period; these samples were measured for gamma activity and specific radionuclide analyses.

Milk is sampled routinely at six local dairies within a 40-kilometer radius of Savannah River Plant, and samples are also obtained from a major distributor (from milk produced in the area and sold by the distributor). These samples are analyzed for tritium, iodine-131, cesium-137, and strontium-90. Over 60 samples of farm produce representing the food categories of leafy vegetables, fruit, grain, poultry, eggs, and meat are collected at 14 locations in the six counties surrounding Savannah River Plant. Six locations are near the SRP perimeter and eight at a distance of approximately 40 kilometers. With the exception of grains, all foods are prepared as though for human consumption and then are subjected to radioanalysis.

SCDHEC and GDNR each monitor milk samples from at least three local dairies in the area surrounding SRP. SCDHEC monitors total strontium, iodine-131, cesium-137, and tritium on a quarterly frequency. GDNR monitors strontium-89, strontium-90, cesium-137, and tritium on a monthly frequency. BF-3 The range of strontium-90 and cesium-137 milk concentrations reported by SCDHEC and SRP is consistent for the 1979-1982 period, although the sampling locations were different. GDNR data for tritium in milk samples from dairies near SRP were comparable with SRP results during the 1980-1982 period.

Fish are trapped routinely in the Savannah River upstream, adjacent to, and downstream of Savannah River Plant for radioanalysis. Fish from the river are also supplied for analysis by the Georgia Department of Natural Resources each year. Crabs and oysters from the Savannah River near the seacoast are analyzed for gamma emitters, including cesium-137, and for strontium-90.

Savannah River Plant conducts annual hunts for controlling onsite deer and hog populations. All deer and hogs are monitored for cesium-137 before being released to the hunters for consumption.

Drinking water

Communities near Savannah River Plant get drinking water from deep wells or surface streams. Public water supplies from 14 surrounding towns are sampled and analyzed semiannually.

Two water-treatment plants downstream from Savannah River Plant supply treated Savannah River water to customers in Beaufort and Jasper Counties in South Carolina, and Port Wentworth, Georgia. The Cherokee Hill Water Treatment Plant at Port Wentworth (Savannah) has been treating Savannah River water during the entire period of operation of Savannah River Plant. The Beaufort-Jasper Water Treatment Plant near Hardeeville, South Carolina, has been in operation since January 1965. The Beaufort-Jasper plant serves a consumer population of approximately 50,000. Treated water from the Port Wentworth, Georgia, plant is used primarily for industrial and manufacturing purposes in an industrial complex near Savannah, Georgia. The Port Wentworth Water Treatment Plant has an effective consumer population of about 20,000. Samples of raw and finished

water at both these plants were collected daily and composited for monthly alpha, nonvolatile beta, tritium, and cesium-137 analyses.

SCDHEC performs independent tritium and nonvolatile beta analyses from water samples at the Beaufort-Jasper treatment facility. These analyses are made at varying frequencies and are comparable with SRP data, although SCDHEC data do not match the sophisticated detection limits attainable by SRP. GDNR collects similar drinking-water samples from the water-treatment facility on a monthly basis and analyzes for alpha, nonvolatile beta, and tritium concentrations. BF-3

6.1.2 Nonradiological monitoring programs

Monitoring the water quality and biota of the Savannah River has been continuing since 1951; SRP stream-water quality has been monitored since 1972.

Air

Wind data are measured at seven 61-meter meteorological towers on the SRP site and at the 366-meter WJBF-TV tower located off the site. Temperature data are also measured at the television tower and at one onsite station that records continuous temperature, maximum and minimum temperature, daily rainfall, relative humidity, and barometric pressure. Rainfall is monitored at the seven meteorological towers at Savannah River Plant.

Ambient air quality measurements at Savannah River Plant include determinations of sulphur dioxide (SO_2), nitrogen oxide (NO_x), ozone (O_3), and total suspended particulates. The SRP air monitoring program and instrumentation meet the requirements for a Prevention of Significant Deterioration monitoring program. In addition, South Carolina and Georgia each have implemented air sampling networks. There are eight sampling locations in the states' networks in the vicinity of Savannah River Plant. SCDHEC and GDNR both monitor for suspended particulates, sulfur dioxide (SO_2), and nitrogen dioxide (NO_2). BF-3

Surface water

Savannah River water is collected monthly at two locations, above and below Savannah River Plant, and analyzed for 24 water-quality parameters. Fecal coliform in water is analyzed from the same locations weekly. A semiannual water sample from the river adjacent to Savannah River Plant is sent to the Georgia Department of Natural Resources for analyses of 14 water-quality parameters, including standard parameters, nutrients, major ions, and fecal coliform counts. GDNR completed additional monthly water-quality analyses at river pumphouse locations in the early 1970s. Concentrations of 32 pesticides or herbicides and PCB are determined at these locations annually. Sediment samples from these locations are analyzed for PCB, herbicides, and pesticides. BF-3

The Academy of Natural Sciences of Philadelphia (ANSP) makes quarterly water-quality surveys at five stations in the Savannah River. Every 5 years, or as a result of major changes in the physiography of the river, ANSP also makes comprehensive surveys of the biota and chemical water quality above, adjacent to, and below Savannah River Plant to ascertain effects of SRP operations.

The U.S. Geological Survey continuously monitors the temperature and flow of the Savannah River above and below Savannah River Plant and at the mouths of Beaver Dam, Four Mile Creek, and Steel Creek. Measurements of the extent of thermal plumes in the river at the mouths of these creeks are made quarterly.

Aquatic biota

The Limnology Department of ANSP, under contract to Du Pont, has been performing a continuing survey of aquatic organisms in the Savannah River upstream, adjacent to, and downstream from Savannah River Plant since 1951 (Matthews, 1982). Diatoms have been and continue to be collected biweekly. Prior to 1982, other algae, invertebrates, and fish were sampled approximately quarterly. In the spring and summer of 1982, ANSP personnel performed a comprehensive baseline study of algae and invertebrates in the mouth of Steel Creek and in the Savannah River just below Steel Creek in conjunction with plans to restart L-Reactor. Another identical study will be completed in 1983. Similar comprehensive studies are tentatively planned for 1984 and 1985.

TC

Mercury from industrial sources above SRP was first detected in fish in 1971. Individual fish were analyzed in 1972 on a quarterly basis by species composites (bream, bass, and catfish). From 1973 through 1975, species composites were analyzed semiannually; from 1976 through 1982, river fish were again analyzed individually. Currently, fish traps are checked weekly at five locations above and below SRP for mercury determination. Mercury levels in fish in 1982 were determined to be essentially the same as those detected in recent years.

Ground water

The quality of the ground water underlying the SRP site is determined by a continuing program of sample collection and analysis for nonradioactive parameters and constituents. Drinking-water supplies from the Tuscaloosa aquifer are sampled and analyzed for content of inorganic ions, organic substances, and metals. Monitoring wells have been installed at both inactive and active waste-disposal sites to gather information about the fate of materials discarded at these sites (Du Pont, 1983b).

Water samples are collected quarterly from ground-water monitoring wells that surround the sanitary landfill site and are analyzed for a number of water-quality parameters. Additionally, water samples are collected and analyzed for trace metals and other drinking-water contaminants once a year. The South Carolina Department of Health and Environmental Control (SCDHEC) has revised monitoring requirements for the sanitary landfills. After four quarters of comprehensive analyses, only semiannual sample collection is needed, with analysis for indicator parameters.

6.1.3 Comprehensive cooling-water study

In July 1983, DOE initiated a 2-year program to determine the environmental effects of cooling-water intake and discharge of the SRP production reactors (C, K, L, and P) and coal-fired power plant operations. This study also draws on the results of ongoing environmental monitoring programs at Savannah River

Plant. The State of South Carolina, the State of Georgia, the U.S. Environmental Protection Agency (Region IV), the U.S. Fish and Wildlife Service (Region IV), and the U.S. Army Corps of Engineers (South Atlantic Division) are participating in this study. The study area includes Par Pond, the SRP onsite streams, the Savannah River swamp, and the Savannah River from Augusta, Georgia, downstream to the area of salt-water intrusion.

Topics to be addressed in the cooling-water study include (1) effects on water usage and quality, (2) wetland effects, (3) effects on fisheries, (4) effects on endangered species, and (5) radionuclide and heavy-metal remobilization, deposition, and effects. Details of these study areas are given below.

Water quality

Water quality studies will provide monitoring data for an assessment of the potential effects of present and proposed SRP activities on the quality of the water used for cooling at the SRP site. The significance of any effects SRP operations have on cooling water will be determined. The quality of water in the Savannah River above and below the SRP, onsite streams, the swamp adjacent to the SRP, and Par Pond will be evaluated. TC

The assessment of thermal effects includes the description and interaction of thermal plumes in the Savannah River swamp along the Savannah River Plant and in the Savannah River from both SRP operations and other thermal effluent sources. These integrated studies are being conducted both upstream and downstream of the Savannah River Plant to facilitate comparisons of assessed values of wetlands, fish spawning, nursery areas, and water quality and to provide perspective concerning the significance of any SRP thermal impacts.

Effects on wetland

Wetlands studies are designed to provide ecological and environmental data for assessing the effects of the operation of the SRP reactors and the 400-D Area coal-fired powerhouse on the wetland ecosystems of the SRP site, including the swamp and onsite streams. The effects to be examined include changes in community structure and diversity, productivity, distribution, habitat use by various wildlife species, and historic changes in vegetation zones in the delta areas where the effluent streams enter the swamp. The comparison of thermally affected and nonthermally affected wetland areas will allow the evaluation of the consequences of releasing cooling water into the SRP streams and swamp system and the significance of those consequences. TC

Effects on fisheries

Ongoing entrainment and impingement studies at the SRP intakes are being incorporated into this comprehensive study. The studies will assess the effect of the withdrawal of fish eggs and larvae and will provide impingement-loss estimates at the intakes. Loss estimates from entrainment and impingement will be related to the relative abundance of river fish populations to determine the effect of SRP operations on the Savannah River system. Current fisheries studies have been expanded to determine the potential spawning areas at approximately 16-kilometer intervals along the Savannah River and near the mouth of named tributaries that enter the Savannah River from Augusta downstream to the area of salt-water intrusion (River Mile 40). Relative abundance of fish eggs and

larvae will be compared to assess the importance of the area near Savannah River Plant as a spawning area relative to the Savannah River system.

Fisheries studies currently being conducted on the Savannah River in the vicinity of Savannah River Plant are being continued and expanded to assess the thermal effects on representative important fish species, including any endangered species. These studies will include (1) assessment of effects on migratory fish by thermal plumes; (2) thermal plume attraction/avoidance, including assessment of over-wintering impacts on growth, cold shock, maturation, and disease and parasitism; (3) effects on spawning and nursery grounds; and (4) seasonal plume habitat modification.

Effects on endangered species

Studies on the effects of heated effluents on endangered species, particularly the American alligator and wood stork and their associated habitat along study-area streams, the Savannah River, and adjacent land areas in the vicinity of Savannah River Plant are being conducted (see Section 6.2.5).

Radionuclide and heavy-metal transport

EJ-3

The objective of this element of the study is to provide monitoring data that can be used to quantify and assess the significance of the release of radionuclides and heavy metals from SRP facilities via cooling water and the subsequent transport of these materials to Par Pond, the onsite stream/swamp areas, the Savannah River, and downriver water-treatment plant facilities. Measurements will be made to determine on-plant and off-plant deposition sites of radionuclides and heavy metals and to evaluate current and future remobilization from these areas. Extensive measurements for radioactivity in water at the Beaufort-Jasper and Port Wentworth water-treatment plants will be made to assess the health significance of releases from SRP operations.

6.1.4 Thermal mitigation study

FK-26

DOE is conducting an evaluation of alternative cooling concepts to mitigate impacts of thermal discharges from the currently operating SRP reactors (C, K, and P). This assessment will include alternative cooling methods (i.e., cooling towers, ponds or lakes, precooled ponds, and spray canals), potential modifications of plant operations and protection of representative and important species. The study will also consider energy recovery systems such as cogeneration and the operation of a fish hatchery as means to mitigate possible thermal effects.

Information developed for each concept will include conceptual design data, capital and operating cost estimates, production loss estimates, effects on other SRP operations, construction schedules, NEPA compliance, and permit requirements. Cost-benefit procedures will be applied to each system to determine its relative value. Effects from current operations will be compared to information developed for alternative cooling concepts to determine if mitigative action is warranted and, if so, what action should be taken. The goals of the

study are to complete and submit the thermal mitigation studies to SCDHEC within 9 months of the signing of the consent order and to implement the recommended thermal mitigation alternative approved by SCDHEC under a schedule to be established by SCDHEC in a subsequent order. DOE will submit and actively support appropriate funding requests to accomplish any actions resulting from the comprehensive thermal studies. FK-26

6.1.5 Epidemiological studies

Regional

Three separate health effects studies of cancer and infant death have been made in areas around Savannah River Plant and in counties using downstream river water (Sauer, 1975, 1976, 1979). These studies encompassed the period from 1949, before SRP startup, through 1976. A fourth study, currently in progress, will consolidate the three previous studies, fill in missing time periods, and update mortality rates through 1978, the most recent year for which mortality data were available from the National Center for Health Statistics. The studies concentrate on those types of cancer for which a proven causal relationship with radiation exposure has been demonstrated.

Occupational

The Occupational Epidemiology Section, Oak Ridge Associated Universities, and the Epidemiology Group, Los Alamos National Laboratory, are each conducting studies of SRP workers. Both the Oak Ridge morbidity and mortality studies of radiation workers and the Los Alamos health effects studies of plutonium workers are in the early data collection and validation phase. Because these are comprehensive studies, results will not be available for several years.

Future

The scope and results of ongoing epidemiological studies designed to assess any possible effects that SRP operations might have on human health were made available by DOE to a panel of experts, including participants from the Centers for Disease Control, the South Carolina Department of Health and Environmental Control, and the Division of Public Health of the Georgia Department of Human Resources. The panel of experts will determine if there is a need for additional epidemiological studies of SRP workers or the population around the Savannah River Plant. DOE will conduct public hearings on the panel's findings and initiate any required epidemiological study as a result of this process.

6.1.6 Ground-water protection

A draft "SRP Groundwater Protection Implementation Plan" was recently developed to examine strategies and schedules to implement mitigative actions required to protect the quality of the ground waters beneath SRP. In addition to the commitment for closing the M-Area seepage basin by April 1985, this site-wide plan considers other remedial actions, including discontinuing the use of seepage basins in F- and H-Areas and the use of the present SRP Burial Ground. AJ-1, DA-5, EN-42

AJ-1, DA-5, EN-42

Contingent on Congressional authorization and approval of a FY 1986 funding request, DOE plans to operate an effluent-treatment facility by October 1988 to process wastewater being discharged to the F- and H-Area seepage basins. The implementation of mitigative actions would be accomplished under DOE's hazardous waste management program; these actions would be compatible with the State of South Carolina hazardous waste management regulations.

The sitewide ground-water protection plan will be the subject of a separate NEPA review. Topics to be discussed in this review include the sitewide use of seepage basins, disposal pits, and the burial ground; remedial and mitigation measures; the decommissioning of currently operating facilities receiving hazardous wastes; occupational and offsite exposures; and effects of research and development activities. Appendix F contains additional details.

6.2 L-REACTOR MONITORING PROGRAMS

Many of the site-wide monitoring programs described in Section 6.1 provide information directly applicable to L-Reactor operation. Monitoring programs specifically related to L-Reactor will provide additional information on the disposition of effluents from L-Reactor. These programs are described below.

6.2.1 Nonradiological monitoring

In addition to the Savannah River measurements described in Section 6.1, the U.S. Geological Survey continuously monitors flow in Steel Creek at the Hattieville site and temperature at the mouth of the creek. Following L-Reactor restart, the dimensions (surface area and cross section) of the thermal plume downstream from the mouth of Steel Creek will be measured quarterly by sampling along river transects. In addition, airborne thermal infrared scanner data will be analyzed to supplement the surface-area measurements.

Savannah River Plant collects water samples monthly from Steel Creek near Cypress Bridge (Du Pont, 1979). These samples are analyzed for 23 water-quality parameters. Additional water-quality monitoring will be conducted in accordance with the National Pollutant Discharge Elimination System permit for L-Area effluents. In February 1983, a comprehensive water-quality monitoring program that includes biweekly sampling of 26 parameters at 8 sites in Steel Creek and several sites above and below Steel Creek in the Savannah River was initiated. Special water-quality sampling, including total residual chlorine monitoring, is planned for the L-Reactor flow test to be conducted prior to the restart.

The existing SRP air quality monitoring programs (Du Pont, 1979, 1983a) are considered adequate to monitor nonradioactive air pollutants from L-Area.

6.2.2 Radiological monitoring

To supplement the existing SRP radiological-monitoring program described in Section 6.1, thermoluminescent dosimeters (TLDs) were installed at the four corners of L-Area in 1981 and are changed every 3 months to measure the accumulated dose. Paddlewheel continuous samplers are located in the L-Reactor cooling-water effluent canal, above L-Reactor on Steel Creek, and below L-Reactor on Steel Creek near Hattieville. Representative composite samples are analyzed weekly for radionuclides.

See also Section 2.1.3 for a discussion of in-plant process and effluent monitoring.

6.2.3 Ground-water monitoring

The quality of ground water at the L-Reactor site will be monitored by four wells located around the L-Area low-level radioactive seepage basin. Water will be collected from these wells quarterly and analyzed for alpha, nonvolatile beta, and tritium as well as several water-quality parameters.

6.2.4 Radiocesium monitoring

DOE has established a comprehensive environmental monitoring program to determine the transport of cesium-137 from Savannah River Plant resulting from the startup of L-Reactor. The program consists of analyses of water samples from Steel Creek, Savannah River, and the downstream water supplies (Beaufort-Jasper, South Carolina, and Port Wentworth, Georgia). Cesium-137 is not detectable in upstream or downstream river samples by routine monitoring techniques that have minimum detection limits of about 1.0 picocurie per liter. The routine monitoring program has been in effect at the site for about 30 years. A special monitoring for cesium-137 and total suspended solids will be conducted for a minimum of 1 year following L-Reactor startup and operation.

Aerial radiological surveys of Savannah River Plant and surrounding areas were conducted by the DOE Remote Sensing Laboratory, operated by EG&G, Las Vegas, in 1974, 1979, 1982, and 1983. These surveys will continue after L-Reactor startup.

Special monitoring programs for cesium-137 and total suspended solids will be conducted during cooling-water cold-flow tests. These data will be used to evaluate releases from individual tests and to verify transport models used to estimate the remobilization of cesium during reactor operations. During tests of limited flow, weekly composite water samples will be taken at the mouth of Steel Creek and at Cypress Bridge. For the full-flow tests, daily composite water samples will be taken at multiple points along Steel Creek. Additional special sampling will be made to determine the amount of cesium-137 transported in the suspended sediments.

The drinking-water monitoring program will include measurements of both cesium-137 concentration in the Savannah River above and below Savannah River

Plant and water-treatment plant raw and finished water above and below Savannah River Plant. The Savannah River estuary and the Savannah River, as well as water-treatment sludge ponds, will be studied to determine potential cesium-137 buildup in sediments. These measurements started in March 1983, and will continue for at least 1 year following L-Reactor startup.

Measurements in the Savannah River will provide a material balance of the total cesium-137 discharged to and transported by the river. Measurements of raw river water and finished drinking water will provide cesium-137 concentrations to verify earlier estimates made for transport. Measurements of cesium-137 in the estuary will be compared to earlier measurements to determine long-term trends.

6.2.5 Ecology

Ecological monitoring plans following L-Reactor restart will emphasize changes in the status of Representative and Important Species (RIS) populations in the Steel Creek ecosystem. Vegetation studies will test for shifts in mortality, biomass, and species distributions in the delta and swamp regions; studies of changes in aquatic community structure will emphasize the lower regions of Steel Creek. Changes in patterns of utilization by selected resident avifauna will be examined with respect to alterations of preferred foraging and nesting areas. Monitoring studies will test for changes in the relative abundance of selected species of many amphibian and reptile species compared with the preoperational period.

Wetlands

The wetlands area affected and the delta growth rate will be monitored with both ground surveys and remote sensing. The ground surveys will be directed toward measuring the extent of effects on selected RIS. Remote sensing will be used to evaluate changes in vegetation patterns over larger survey areas and to estimate delta growth rates.

American alligator

Radiotelemetric studies have been conducted on adult male and female alligators in the Steel Creek corridor and delta since 1980 to evaluate their behavior and movements. Consultation with the U.S. Fish and Wildlife Service in the fall of 1982 outlined several steps to mitigate potential effects of L-Reactor startup on the Steel Creek alligator population.

The Steel Creek corridor will continue to be monitored to assess effects on the alligator population. Radiotelemetric studies, which have already been initiated with adult alligators, will continue at least through the winter following L-Reactor restart to determine the response of the Steel Creek alligator population to the startup.

AP-6, AY-2, BA-6, CV-1

Earlier studies were based on L-Reactor restart with the direct discharge alternative. Because the preferred cooling-water alternative is now the 1000-acre lake, DOE has reinitiated consultations with FWS and has transmitted the most recent information on impact projections (Sires, 1984a).

Wood stork

The wood stork is listed as endangered by the U.S. Fish and Wildlife Service. Aerial surveys of the Savannah River swamp were conducted weekly from July 1981 to March 1982 and at irregular intervals from April to September 1982. Aerial surveys of the Birdsville rookery near Millen, Georgia, were conducted at irregular intervals from March to June 1982. Ground observations in the Steel Creek area have also been made (Appendix C). The field studies on the species have been expanded for summer 1983. Aerial and ground surveys will define the use of the SRP swamp system and any nearby rookeries, including the Birdsville rookery. In addition, use of other feeding areas by the Birdsville wood stork population will be evaluated. Previous survey information, along with these expanded studies, will be used to support consultation with the U.S. Fish and Wildlife Service on this species.

DOE has prepared a Biological Assessment for FWS review and use in formulating its Biological Opinion (Sires, 1984b). DOE is continuing to conduct studies and will continue to apprise FWS of the results. AP-6, AY-2, BA-6, CV-1

Shortnose sturgeon

Sturgeon larvae were identified in samples taken near the SRP pumphouses at the Savannah River during the 1982-1983 biological measurements program. A few of these were determined to be the federally endangered shortnose sturgeon (Appendix C). A biological assessment and consultation process with the National Marine Fisheries Service (NMFS) has been completed for this species. The NMFS has concurred with the DOE determination that the population of the shortnose sturgeon in the Savannah River would not be jeopardized (Oravetz, 1983). AP-6, AY-2, BA-6, CV-1

6.2.6 Archeology

Five archeological sites have been identified that could be affected by L-Reactor restart (see Section 3.1.3). Each of the five sites will be monitored on a monthly basis during the first 2 years of the L-Reactor operation to determine whether erosion occurs. If no erosion is evident at the end of the 2-year monitoring period, then the sites should be considered sufficiently protected to assure preservation.

Active erosion protection will be undertaken in the event that adverse erosion threatens the integrity of any of the sites. If erosion barriers are ineffective, recovery and documentation of the archeological data would be carried out.

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7 FEDERAL AND STATE ENVIRONMENTAL REQUIREMENTS

This chapter summarizes the Federal and State of South Carolina requirements that are applicable to the resumption of L-Reactor operations. Table 7-1 lists the permits and other environmental approvals needed for L-Reactor to resume operation. The requirements related to the cooling-water discharge reference case (direct discharge) and the preferred cooling-water alternative (the 1000-acre lake) are listed in Table 7-1; requirements corresponding to other cooling-water discharge alternatives are discussed in Section 4.4.2. To ensure that the preferred cooling-water alternative is a viable option for the decision-maker consistent with the restart of L-Reactor as soon as practicable, the Department prepared and filed dredge and fill (404) and NPDES permit applications with the U.S. Army Corps of Engineers and the South Carolina Department of Health and Environmental Control (SCDHEC), respectively, before the completion of this Final EIS. The requirements emphasize air quality, water quality, the disposal of solid and hazardous wastes, the protection of critical wildlife habitats, and the preservation of cultural resources. TC

In addition to securing these permits and complying with applicable standards, as would be required for any similar large industrial facility, the Department of Energy (DOE), as a Federal agency, is also required to comply with a number of separate environmental requirements, such as the National Environmental Policy Act and wetlands/floodplains review requirements. DOE has established its own orders and regulations to assure the environmental, health, and safety protection of its facilities (Section 7.7).

National Environmental Policy Act of 1969, as amended (NEPA) (42 USC 4321 et seq.)

The National Environmental Policy Act of 1969, as amended, requires "all agencies of the Federal Government" to prepare a detailed statement on the environmental effects of proposed "major Federal actions significantly affecting the quality of the human environment." Signed by President Reagan on July 14, 1983, the Energy and Water Development Appropriations Act of 1984 directed the Department of Energy to prepare an environmental impact statement (EIS) on L-Reactor on an "expedited" basis. On July 15, the Federal District Court of Washington, D.C., ruling on a lawsuit filed in November 1982, directed the Department of Energy to prepare an EIS on the proposed restart of the L-Reactor as soon as possible. This environmental impact statement has been prepared in accordance with the Council on Environmental Quality Regulations on Implementing National Environmental Policy Act (40 CFR 1500-1508) and DOE Guidelines for Compliance with the National Environmental Policy Act (45 FR 20694, March 28, 1980). TC

Atomic Energy Act of 1954, as amended (42 USC 2011 et seq.)

DOE is required to comply with radiation guidance pursuant to the Atomic Energy Act of 1954, as amended (42 USC 2021(h)). In accordance with the Energy Reorganization Act of 1974, DOE defense-related operations are not subject to the regulations of the Nuclear Regulatory Commission. DOE has issued extensive standards and requirements to ensure safe operations.